

# Brookhaven National Laboratory

Annual Report on BNL's Next Generation Safeguards Initiative  
Human Capital Development Activities

Prepared by Susan E. Pepper with  
contributions from staff of the  
Nonproliferation and National Security  
Department

October 2014

BNL- 106206-2014-IR

**BROOKHAVEN**  
NATIONAL LABORATORY

*a passion for discovery*



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

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Prepared by Susan E. Pepper

October 2014

**Nonproliferation and National Security Department**

**Brookhaven National Laboratory**

**U.S. Department of Energy  
National Nuclear Security Administration  
Defense Nuclear Nonproliferation**

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## **1. Introduction**

Brookhaven National Laboratory's (BNL's) Nonproliferation and National Security Department is pleased to provide this report of work performed during Fiscal Year (FY) 2014 for the National Nuclear Security Administration's Office of Nonproliferation and International Security under the Next Generation Safeguards Initiative (NGSI).

BNL's NGSI budget for Human Capital Development work in FY2014 was \$678,736. BNL's total expenses were \$649,080.

## **2. University Engagement**

SUNY-Stony Brook Nonproliferation Courses – BNL consultant Chris Kessler designed and taught two courses on the topics of International Safeguards and Nonproliferation and International Trade and Security at Stony Brook University. The former course was sponsored by the NGSI HCD sub-element and SUNY-Stony Brook sponsored the latter. His work included proposing the courses to the graduate and undergraduate curriculum committees and adapting the course material to the Stony Brook class format. The syllabus for the International Safeguards and Nonproliferation Course is included in Appendix 1.

Nuclear Chemistry Summer School – Susan Pepper spoke at BNL's Nuclear Chemistry Summer School on July 15 on job opportunities for nuclear chemists at the IAEA.

Brookhaven's nonproliferation textbook, "Deterring Nuclear Proliferation: The Importance of IAEA Safeguards," is in wide use and continues to be downloaded. In August, BNL began working with the subcontractor, NNSS Consulting, LLC, to plan for the publication of the textbook. NNSS incorporated comments from students and is confirming permissions to use figures and photos. In FY15, BNL will finalize arrangements for publishing.

Table 1 provides a list of lectures that were presented by BNL staff members to student groups from universities in the Northeast region.

BNL also supported a project led by Idaho National Laboratory on the development of course material for a nonproliferation course module and provided feedback and comment when needed. BNL participated in university outreach during the creation of this material and assisted with analyzing the existing education tools available.

**Table 1:** Guest Lectures and Student/Teacher Visits at BNL

University Name	University Department	Point-of-Contact	Guest Lecturer Name	Lecture Topics	Lecture Date
City College of New York		Masahiro Kawaji, Jean Krasno	Les Fishbone	Safeguards implementation, traditional Safeguards verification methods, enhanced IAEA Safeguards verifications	3 lectures between October 29 and November 12
City College of New York		Masahiro Kawaji, Jean Krasno	Carol Kessler	Nuclear Security	November 26
City College of New York		Masahiro Kawaji, Jean Krasno	Warren Stern	Nuclear and Radiological Terrorism	November 19
BNL Nuclear Chemistry Summer School	N/A	Louis Pena, BNL	Susan Pepper	Job Opportunities at the IAEA	July 15
Penn State University	INMM Student Chapter	Christopher Sopko, Student	Multiple	Safeguards activities at BNL	March 20-21

### 3. Safeguards Internships

In Fall 2013, Caitlin McKibben and Ian Andrews continued to support the Episodes project under the mentorship of Nick Gallucci. Ms. McKibben worked under a contract that extended into the Fall, and Mr. Andrews worked pro bono while he awaited admission to graduate school. In FY14, Ms. McKibben was studying for her M.A. at the University of Georgia, and Mr. Andrews began studies at the University of Maryland. Mr. Andrews plans to apply for the Nonproliferation Graduate Fellowship Program in FY15.

In Summer 2014, seven NGSF-funded interns worked with BNL's Nonproliferation and National Security Department (NN) during Summer 2014. Jack Dishner prepared a paper and poster on safeguards associated with deep borehole repositories. Emily Roston researched women's roles in the nuclear workforce in

North Africa and assisted with research on cultural awareness. Daniel Cisek and Dominick Raimondi assisted Nick Gallucci with research on the Iranian and other countries' nuclear fuel cycles. Mr. Raimondi also provided computer support to NN and assisted Sarah Poe with the GovAtom project and the development of a database for the Human Capital Development Metrics Database.

Katherine McCarthy assisted Sarah Poe and Colin Carroll with preparations for the Systematic Approach to Training Workshop and participated in the workshop July 14-18. BNL extended Ms. McCarthy's internship until September 5 so that she could help with preparations for an INSEP meeting in Indonesia. Luis Ocampo researched safeguards following catastrophic events such as the Great East Japan Earthquake and tsunami and the Chernobyl accident. Mr. Ocampo was the runner up in the 2014 INMM JD Williams Student Paper Competition. His paper on Safeguards by Design was based partly on research conducted during his internship at BNL in 2013.

Jed Dale worked with Susan Pepper, Katherine Bachner, Scott Bronson, and Anwar Hossain on a safeguards curriculum for high school teachers and students that BNL's Office of Education will use.

An eighth intern, Laura Shanklin, hosted by BNL's Office of Educational Programs, conducted a study of nuclear nonproliferation and safeguards professionals to learn about their motivations to enter the field. Her study included a survey and on-camera interviews of nonproliferation and international safeguards practitioners. NN assisted her with this project by compiling a list of international safeguards practitioners for the survey and by participating in the on-camera interviews.

All of the students prepared posters and/or papers on their research topics for a BNL poster session that was held on August 7, 2014, where the students displayed their work.

BNL made plans for Dominick Raimondi to continue to assist with NN projects through the Fall under NN programmatic funds. However, Mr. Raimondi began a full time position in a local financial services firm on September 2. He worked one additional week at the end of August on the Metrics Database. Emily Roston returned to BNL to continue her assignment with NN on September 2. Emily continues work on the role of women in the nuclear workforces in North Africa and the Middle East, but she will primarily assist Katherine Bachner with research on cultural awareness. Emily will attend the International Conference on Women in Engineering and Science in Los Angeles, CA, October 23-25, 2014. The meeting is being held in conjunction with the Society of Women Engineer's Annual Meeting and Career Fair. The INWES chair, Gail Mattson, a BNL Associate Laboratory Director, encouraged Ms. Roston to attend the meeting and present a poster on her work at BNL. This meeting will give Ms. Roston the opportunity to meet with women from the MENA region and interview them.

Table 2 provides background information on the interns and their projects.

#### **4. Safeguards Courses – Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century**

BNL held the Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century course for graduate students at BNL June 9-27-2014. Nineteen students, representing twelve foreign countries, were accepted through a rigorous application process to attend the course. In addition, six BNL interns attended portions of the course. The schedule for the course is provided in Table 3, and a list of students is provided in Table 4. A summary of expenses is provided in Table 5. Student evaluations are provided in Appendix 2.

#### **5. Professional Development**

BNL has several early career professionals who benefit from the professional development funds provided by NGSI. In FY14, four BNL staff participated in four activities. Sarah Poe and Jose Gomera attended the Next Generation Safeguards Professional Network meeting at Sandia and Los Alamos National Laboratories. Nicholas Gallucci attended project management training at BNL. Katherine Bachner attended the JRC-Ispira Nuclear Safeguards and Nonproliferation meeting. Trip reports from Katherine Bachner, Nick Gallucci, Jose Gomera and Sarah Poe are provided in Appendix 3.

Subcontractor Chris Kessler delivered a series of safeguards lectures to BNL staff members in 2013-2014. In this way, BNL increased the effectiveness of NGSI Professional Development funding by enabling both early and mid-career professionals to learn from a senior safeguards expert. Lectures were scheduled to maximize the attendance of early career professionals. In FY2014, lectures were delivered on the following topics:

- Safeguards in the Olden Days: Safeguards before 93+2
- IAEA Program 93+2: Revolutionizing IAEA Safeguards
- Finding Technical Agreement after a Political Maelstrom: Safeguards for Gas Centrifuge Enrichment Plants
- After Zero, Preventing Break-out: Data for Bayes' Theorem



**Table 2:** BNL's FY2014 Interns

Name	Citizenship	Affiliated University	Level of Education	Major	Summer Project	Mentor Name	Next Steps
Luis Ocampo	Columbia	Penn State	M.S.	Nuclear Engineering	Safeguards following catastrophic incidents	Susan Pepper	Return to Penn State for PhD studies; would like to perform PhD research at BNL plans to work in safeguards policy
Emily Roston	US	Tufts University	B.A.	Political Science	Women in Science and Engineering in the MENA Region	S. Pepper, Kate Bachner	Follow on internship at BNL; possible internship with NGO; considering graduate school options
Daniel Cisek	US	St. Joseph's College	College Senior	Math	Data Visualization	Nick Gallucci	Complete undergrad education
Dominick Raimondi	US	SUNY-Farmingdale	B.S.	Computer Science	Data Visualization	Nick Gallucci	Began work for a financial services firm
Katherine McCarthy	US	Monterey Institute for Int'l Studies	M.A.	Int'l Policy – Non-proliferation and Terrorism Studies	Workshop on Systematic Approach to Training	Sarah Poe	Seeking position in nonproliferation in Washington, DC area
Jack Dishner	US	University of Georgia	B.A.	International Affairs	Safeguards for Deep Borehole Repositories	S. Pepper, Joe Brady	Georgetown University; NGP Fellow applicant
Jed Dale	US	University of PA	High School		Safeguards curriculum for high school students	Scott Bronson, K. Bachner, Anwar Hossain	Entered University of Pennsylvania

**Figure 1:** Photo of BNL Summer 2014 Interns (from left, Jack Dishner, Katherine McCarthy, Dominick Raimondi, Jed Dale, Susan Pepper (mentor), Daniel Cisek, Luis Ocampo, and Emily Roston)



**Table 3:** Course Schedule for Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century

Week One   June 9-June 13					
	Morning 1	Morning 2		Afternoon 1	Afternoon 2
Mon June 9	WELCOME TO BNL  ADMINISTRATIVE	WELCOME TO BNL  ADMINISTRATIVE  ----- WELCOME TO CLASS		Introduction to Nuclear Energy & the Fuel Cycle  Nick	Weapons-Related Materials & Activities:  <i>HEU and Enrichment</i>  <i>Charles Ferguson</i>
Tues June 10	Weapons-Related Materials & Activities:  <i>Plutonium Reprocessing</i>  Charles Ferguson	Early Nuclear Policy:  <i>Acheson Lilienthal/Baruch</i>  Barclay Ward		Early Nuclear Policy:  <i>From Denial to Atoms for Peace</i>  Barclay Ward	Early Nonproliferation Policy:  <i>Atoms for Peace to the NPT</i>  Barclay Ward
Wed June 11	Early Nonproliferation Policy  <i>Bilateral Safeguards and the IAEA before the NPT</i> Chris Kessler	NPT History and Structure:  <i>Negotiation of the NPT</i>  Barclay Ward		NPT History and Structure:  <i>Articles I,II,III IAEA created</i>  MDR	NPT History and Structure:  <i>Article IV Peaceful Nuclear Cooperation</i>  Carol Kessler
Th June 12	NPT History and Structure: <i>Article VI 1995 REVCON, 13 steps, Getting to Zero</i> Carol Kessler	NPT Challenges  <i>2010 &amp; 2015 REVCONS</i>  Susan Burk		NPT Challenges  <i>Is the NPT Failing? Could it?</i>  Susan Burk	NPT Challenges   Henry Sokolski
Fri June 13	Safeguards History and Structure: <i>INFCIRC 153 Structure Noncompliance, Special Inspections, code 3.1</i>  MDR	Safeguards History and Structure: <i>Material Balance Accounting/ Design Approaches Concealment</i>  MDR		LAB TOUR (NEEDS TO BE SCHEDULED WITH TOUR OFFICE) And talk with Ralph James about visit to his labs	Laura Rockwood

Week Two   June 16-June 20					
	Morning 1	Morning 2		Afternoon 1	Afternoon 2
Mon June 16	<b>Radiological Training</b>  Jay Adams	<b>Radiological Training</b>  Jay Adams		<b>Safeguards Equipment &amp; Techniques</b>  Susan P./ Shirley	<b>DIV Prep</b>  Ed Sierra/ Johnson
Tues June 17	<b>DIV Simulation/PIV Procedures on Real Isotopes/On sand</b>  Ed Sierra, Shirley Johnson, Chuck Finrock, Sam Velazquez			<b>DIV Simulation/PIV Procedures on Real Isotopes/On sand</b>	
Wed June 18	<b>DIV Presentations and Follow-up</b>  Ed Sierra/Johnson	<b>Safeguards History and Structure:</b>  <i>Bulk Processing Facilities: Enrichment Plant Safeguards</i>  Johnson		<b>Safeguards Challenges:</b>  Brian Boyer	<b>Safeguards Challenges:</b>  <i>The Need for Strengthened Safeguards: Iraq and North Korea</i>  MDR
Th June 19	<b>Strengthened Safeguards:</b>  <i>Transformation of Safeguards Under the AP</i>  MDR	<b>Strengthened Safeguards:</b>  <i>Open Source Information Collection and Analysis. Including satellite imagery</i>  George Anzelon		<b>Strengthened Safeguards:</b>  <i>Current safeguards issues as seen by DG's Advisory Group</i>  Kory Budlong-Sylvester	<b>Strengthened Safeguards:</b>  <i>State Level Concept – Status 2014; Looking Ahead</i>  Kory Budlong-Sylvester
Fri June 20	<b>Regional Challenges</b>  <b>DPRK</b>  Joel Wit	<b>Regional Challenges</b>  <b>Iran Status report, Negotiating issues</b>  Gary Sick		<b>Controlling spread of Sensitive Technology – COCOM to Wassenaar</b>  Chris Kessler	<b>21st Century Game-changers</b>  <b>The US-India Agreement</b>  Chris Kessler

Week 3   June 23-June June 27					
	Morning 1	Morning 2		Afternoon 1	Afternoon 2
Mon June 23	<b>21st Century Game-changers</b>  <i>Centrifuges, a new A Q Khan network, and future challenges</i>  Tom Graham	<b>21<sup>st</sup> Century Game-changers</b>  <i>South Asia</i>  Toby Dalton		<b>21<sup>st</sup> Century Game-changers</b>  <i>Disconnect Between Plausible Threats and Existing Tools</i>  Tom Graham	<b>Nuclear Security Issues</b>  <i>Nuclear Security Summit; Global Fissile Materials Issues; CPPNM</i>  Deepti Choubey
Tue June 24	<b>Nuclear Security Issues</b>  <i>9/11 and the threat of nuclear terrorism</i>  Warren Stern	<b>Nuclear Security Issues</b>  <i>Radiological Terrorism</i>  Kathleen McIntyre		<b>Technical Tutorial</b>  <i>Detecting nuclear materials</i>  Charles Finrock	<b>Technical Tutorial</b>  <i>Detecting nuclear materials</i>  Charles Finrock
Wed June 25	<b>Global Nuclear Detection Architecture Simulation</b>  Greg Bernard			<b>Global Nuclear Detection Architecture Simulation</b>  Greg Bernard	
Thu June 26	<b>Student Presentations</b> MDR TO DEVELOP THEMES AND BACKGROUND MATERIAL			<b>Student Presentations</b> MDR TO DEVELOP THEMES AND BACKGROUND MATERIAL	
Fri June 27	<b>Wrap Up</b>				

**Table 4:** Student Participants for Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century

Name	Citizenship	Undergrad University/Degree	Graduate School/Degree	Field(s) of Study	Current Employer	Next Steps
Piotr Andrzejewski	Poland	Warsaw University of Technology – B.S.	Warsaw University of Technology – M.S.	Engineering, Electronics, and Computer Engineering		Very interested in joining the IAEA
Benigno Aquino	Philippines	Vienna University of Technology – B.S.	Vienna University of Technology – M.S.	Physics, Physical Energy and Measurement Engineering		
Daniel Cisek*	US	St. Joseph's College - Senior	N/A	Math		Complete undergrad education
Arunjana Das	India	Indian Institute of Technology – Delhi – B.S.	American University - PhD	Mechanical Engineering, Int'l Relations		
Jed Dale*	US	University of PA - Freshman	N/A			Entered University of Pennsylvania
Jack Dishner	US	University of Georgia – B.A.	Georgetown University	International Affairs		NGP Fellow applicant
Igor Deryabin	Ukraine	Pryazovskyi State Technical University – Bachelor	Pryazovskyi State Technical University – Specialist	Automation and Computer Integrated Technologies	State Nuclear Regulatory Inspectorate of Ukraine	
Kuros Ghaffari	US	UCLA – BA	Elliott School of Int'l Affairs – M.A.	Communications Studies, Int'l Affairs/Security Studies		

Christine Johnson	US	Georgia Institute of Technology – B.S.	University of Texas – Austin - PhD	Physics, Mechanical Engineering		
Chutima Kongvarhodom	Thailand	King Mongkut’s Institute of Technology Ladkrabang – B.E.	University of New Brunswick – Doctor of Engineering	Chemical Engineering	Center for Nuclear Energy Research, University of New Brunswick	Seeking a new position; BNL recommended that Ms. Kongvarhodom apply for the IAEA Traineeship program
Christine Leah	France, Australia	University of Queensland	MIT	International Relations, Political Science, Strategic and Defense Studies		Complete PhD
Katherine McCarthy*	US	Monterey Institute for Int’l Studies	M.A.	Int’l Policy – Non-proliferation and Terrorism Studies		Seeking position in nonproliferation in Washington, DC area
Erin McLaughlin	US	University of Georgia – B.A.		International Affairs		
Luis Ocampo*	Columbia	Penn State	M.S.	Nuclear Engineering		Return to Penn State for PhD studies; would like to perform PhD research at BNL plans to work in safeguards policy
Sobia Paracha	Pakistan		Gov’t Post Graduate	Politics and Economics	University of Georgia –	

			College for Women – B.A.		visiting scholar	
Trevor Persi	Canada	University of Toronto	Carleton University – M.A.	Criminology, Sociology, Int'l Affairs		
Stoica Popa	Romania	Stanford University - B.A.	Harvard University - MPP	Political Science; Political and Economic Development	Texas Global Business and Microfinance Brigades	
Morena Priori	Italy	Kings College London – B.A.	Kings College London – M.A.	Diplomacy and Chinese Studies; Nonproliferation and Int'l Security	N/A	
Dominick Raimondi*	US	SUNY-Farmingdale – B.S.	N/A	Computer Science	Financial services firm	Began work for a financial services firm – September 2014
Emily Roston	US	Tufts University – B.A.	N/A	Political Science	BNL internship	possible internship with NGO; considering graduate school options
Laura Shanklin*	US	SUNY-Geneseo – College Sophomore	N/A	Political Science	N/A	Return to college; career in safeguards and nonproliferation policy
Thurlough Smith	US	SUNY-Stony Brook – B.A.	SUNY-Stony Brook – MS, PhD	Earth Science, Energy, Environment and Security	N/A	Return to grad school – complete degrees



Jennifer Therrien	US	Brown University – B.A.	Georgetown – MS	Science and Society; Foreign Service	N/A	Return to grad school – complete MS
Alicia Trauth	US	University of Cincinnati – B.S.	University of Cincinnati – PhD	Chemistry	N/A	Return to grad school – complete PhD
Brandon Wilson	US	Ohio State University – B.S.	Ohio State University – M.S.	Nuclear Engineering	N/A	Return to grad school – complete MS

\*Part time, unofficial attendee

**Table 5:** Summary of Course Expenses for Nuclear Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century

Cost Element	Expense	Comment
BNL Organizational Labor	\$100,573	Labor for BNL staff involved in organizing and monitoring the course
BNL Instructor Labor	\$17,023	Labor for BNL staff participating in the course as lecturers
Student Stipends	\$9,854	Payments to students to cover meals and incidental expenses
Student Housing	\$15,224	Payments for on-site housing for students, June 9-27
Honoraria	\$2,302	Payment for three lectures not covered by subcontracts
Miscellaneous Costs	21,326	
Subcontractors	\$52,673	Subcontract with Michael Rosenthal's for organizing and leading the course and travel and additional subcontracts for payment of lecturers' labor and travel

**Table 6:** BNL Staff Participation in Education and Training under Funding from NGSi HCD

<b>Staff Member(s)</b>	<b>Course/Training</b>	<b>Date</b>	<b>Cost</b>
Katherine Bachner	JRC-Ispra Course on Safeguards and Nonproliferation	March 31 – April 4, 2014	\$11,000
Sarah Poe, Jose Gomera	Next Generation Safeguards Professional Network Meeting, LANL and SNL	March 2014	\$14,446
Nick Gallucci	Project Management Professional Boot Camp	October 2013	\$4816
Katherine Bachner	INL Pyroprocessing Course	August 2014	No cost to HCD

## **6. Recruitment**

BNL's International Safeguards Project Office (ISPO) is funded by NGSi HCD at the level of .5 FTE for recruitment of U.S. citizens for positions in the IAEA Department of Safeguards. In FY14, ISPO worked with NA-241 to improve reporting on its enhanced recruitment activities. Quarterly reports are prepared for NA-241 HCD program manager and shared with the Subgroup on Safeguards Technical Support. The information in this report is based on information found in the first three quarterly reports of FY14. Tanya Collins will submit her fourth quarter report to Headquarters on October 15, 2014.

In FY14 ISPO began collecting statistics on the number of people who contact ISPO for guidance and identifying people who are returning to the United States following assignments at the IAEA so that Headquarters and ISPO can help them in finding follow-on positions and/or assist with funding.

During FY14, ISPO made arrangements to have a subcontractor, Jeanne Anderer, update the ISPO Guidebook for U.S. Citizens Going to Work at the IAEA. The new edition will be published in Fall 2014.

**Figure 2:** Percentage of U.S. citizens working at the IAEA in Safeguards positions subject to Geographical Distribution

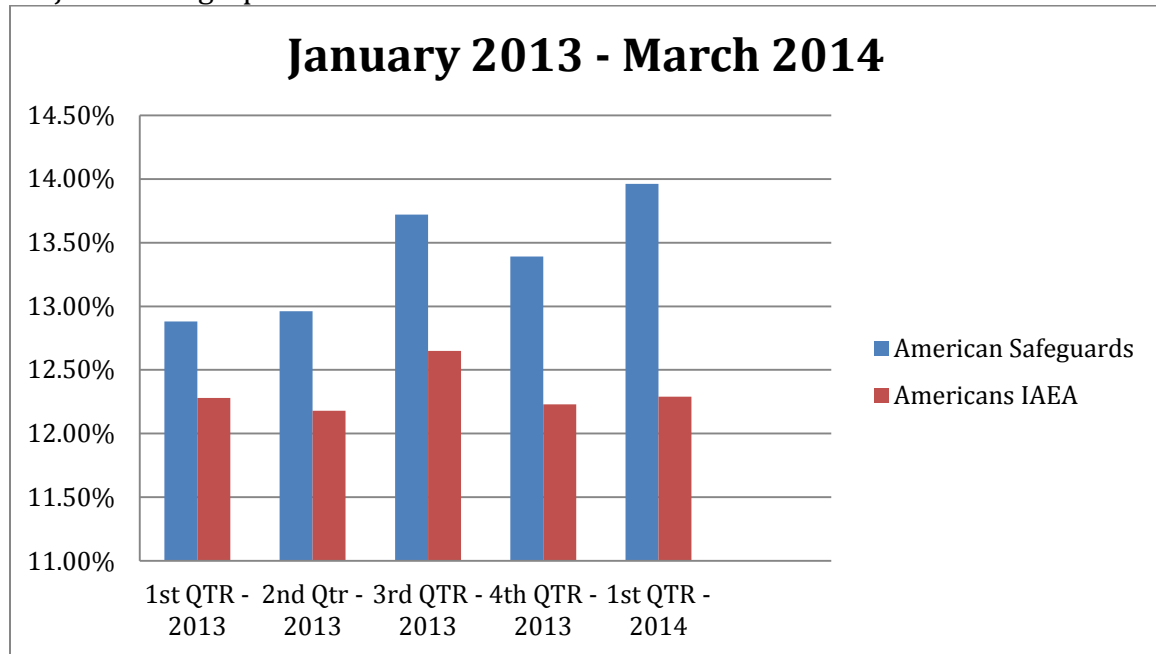


Table 7 summarizes ISPO's participation in trade shows and career fairs. ISPO focuses on events that are related to the nuclear field. In FY14, the number of events was reduced at the request of the Subgroup on Safeguards Technical Support, and ISPO will attend some events, such as the Society of Women Engineers Annual Meeting every other year. ISPO coordinates its attendance at these events with ANL to reduce costs. NGSI HCD does not fund ISPO's participation in these events, but they are considered a good source of well-qualified candidates and the best way to increase awareness of the IAEA in the general public.

**Table 7: ISPO 2014 Conference Schedule**

<b>2014 Conference Schedule</b>			
<b><u>Dates</u></b>	<b><u>Event</u></b>	<b><u>Location</u></b>	<b><u>Traveler</u></b>
<b>April 3-6</b>	American Nuclear Society Student Conference	University Park, PA	Tanya & ANL
<b>July 7-11</b>	2014 Society for Industrial and Applied Mathematics Annual Meeting	Chicago, IL	Tanya & ANL
<b>July 20-24</b>	Institute of Nuclear Materials Management	Atlanta, GA	Susan, Ray & Steve Amundson (ANL)
<b>November 11-14</b>	American Nuclear Society Winter Meeting	Anaheim, CA	Tanya & ANL
<b>2014 University Schedule</b>			
<b><u>Dates</u></b>	<b><u>Event</u></b>	<b><u>Location</u></b>	<b><u>Traveler</u></b>
<b>October TBD</b>	Columbia University STEM Career Fair	New York, NY	Tanya, Ray & Terrence
<b>November TBD</b>	North Carolina University Masters and PhD Career Fair	Chapel Hill, NC	Tanya & Josh

## **7. Miscellaneous**

### **Intercultural Preparedness White Paper Project**

Katherine Bachner produced a deliverable on intercultural preparedness as it relates to nuclear safeguards professionals by writing a white paper for HCD espousing the importance of the topic. The report outlines Ms. Bachner's development of a two-tiered approach to intercultural preparedness training, one that focuses in its first phase on developing fundamental levels of understanding and awareness of cultural paradigms that have been well-researched in social psychology, anthropology, and related fields, and in the second phase on developing preparedness and competency for specific cultural engagements (i.e., engagement with specific countries and groups). The white paper Ms. Bachner produced will serve as the basis for the pilot training program of intercultural preparedness that has been discussed with HQ, and which is currently planned to undergo initial development during the second quarter of FY 15.

One of the highlights of the project in FY 14 was the presentation of Ms. Bachner's work on intercultural preparedness training at the IAEA's Human Resources Development Conference in Vienna in May 2014 (see below). The main theme of her paper, the importance of developing intercultural preparedness training for nuclear power and other related programs, was included in the final

recommendations of the conference. Representatives of the IAEA's Safeguards Training Section were in attendance and commented that Ms. Bachner's work is of value to the Section.

### **International Conference on Human Resource Development for Nuclear Power Programmes: Strategies for Education and Training, Networking and Knowledge Management**

The IAEA's International Conference on Human Resource Development for Nuclear Power Programmes: Strategies for Education and Training, Networking and Knowledge Management was held at the Vienna International Centre May 12-16, 2014. The Next Generation Safeguards Initiative sponsored Susan Pepper's and Katherine Bachner's participation in the meeting. On Tuesday, May 13, Ms. Pepper made an interactive presentation entitled, "The Value of the Junior Professional Officer (JPO) Program to the IAEA and its Member States." On Thursday, May 15, Ms. Bachner made an interactive presentation entitled, "Promoting Intercultural Competencies." BNL prepared a paper for NA-241, BNL-105409-2014-IR, dated June 2014, summarizing the meeting.

### **HCD Roadmap Study**

BNL continued to support Oak Ridge National Laboratory in ongoing work to collect data from NGSI HCD program participants to develop metrics for analyzing the human capital pipeline and on the development of knowledge management methods. This project has continually surveyed short and university courses to identify if HCD needs are currently met. This information is being collected and organized in the SHULA database, which is currently under development. SHULA will be a useful tool for organizing the data collected through the surveys and storing information regarding participants trained by NGSI HCD.

**Appendix 1: Syllabus for Stony Brook University Course on Nuclear  
Nonproliferation and International Safeguards**

**EST 556 – Nuclear Nonproliferation & International Safeguards**

**Department of Technology & Society**

**Wednesday 5:30 – 8:20**

**Social & Behavioral Sciences N110**

**Visiting Professor J. Christian Kessler**

Office: Harriman 348  
Cell/business: 571-426-0839

Office hours: Monday 2:00 – 5:00  
[Chris.Kessler@stonybrook.edu](mailto:Chris.Kessler@stonybrook.edu)

**Course Description & Objectives**

World War II ended with visions of global peace, and building a system to abolish nuclear weapons began in January 1946. In the 1950s the world pursued Atoms for Peace and built the International Atomic Energy Agency (IAEA), even as many states, from France to India to Sweden, planned nuclear weapons. We built an international system to stem the spread of nuclear weapons, including the Nuclear Non-Proliferation Treaty (NPT) and the IAEA was charged to verify the peaceful use of nuclear energy. As the nonproliferation system became more complex & capable, so did efforts to evade it. Iraq stunned the world with how far Saddam had succeeded, and a vigorous response ensued. Today Iran and North Korea confront United Nations Security Council efforts to stop proliferation. This course will examine the technologies of nuclear energy, the institutions built to address the security threats related to nuclear energy, and the issues and challenges confronting those institutions today.

You will learn the history of the nuclear nonproliferation regime since 1946, with emphasis on the evolution of concepts & practice; and the variety and complexity of motivations for governments to seek nuclear weapons, and in many cases, to forswear nuclear weapons. You will learn about the different technologies that comprise the civil nuclear fuel cycle, and how some of these same technologies are critical components of a nuclear weapons program. The course will emphasize how nuclear energy technologies, verification technologies, international legal practice, and politics all play important roles in the evolution, current practice, and effectiveness of the international nuclear nonproliferation regime.

**Course Requirements and Grading**

You are expected to keep up with the required reading and lecture material. Class time will be split between lectures and seminar style discussions. Active participation in discussions, and ***active questioning during lectures***, is expected. A term (10-12 page) paper on a topic relevant to the course is required. There will be a final exam.

Theme of the day or "text" submission

As those of you raised in religious traditions will know, when the preacher, priest, rabbi, or imam gives his sermon, a very short passage from a religious book is often cited as the central theme or starting point; this is sometimes called the "text" for the sermon. For discussion and some lecture classes

(identified below by a Φ), you are to bring to class a famous quote, a few lines from a song or poem, or a quotation you think captures an important point in the readings for that class. Examples:

- Genghis Khan, he could not keep  
All his kings supplied with sleep,  
[do you know the song/author?].
- Ask not what your country can do for you, ask what you can do for your country.  
[you should recognize the speaker]
- Let us never negotiate out of fear. But let us never fear to negotiate.
- For only when our arms are sufficient beyond doubt can we be certain beyond doubt that they will never be employed.  
[both from same speech as #2 above]
- No one heard his dyin' words, but that's the way it goes [Pancho & Lefty, Townes van Zandt]

You will be asked to turn these papers in at the beginning of class, and I will use some of them as themes for class discussion. These papers are required as part of class participation, failure to submit a paper will detract from course participation, but content will not be graded. This is to think about the core message of the readings.

#### **Term Paper**

This is a standard research & analytical paper, examining an issue of your choosing. You select a topic; exotic topics should be cleared with me. This paper should be written using standard academic format, citations (foot- or end-notes), and independent authorship. All papers are to be type-written. Good writing skills, organization, structure, and grammar are all important. Papers may be handed in either in hard copy or electronically, but are to be turned in on time. [date] close of business (5:00 pm)

#### **Elements of Final Grade**

Grades will be assigned using the 4.0 point scale. Grade will be composed of:

Class participation	30%
Term paper	35%
Final exam	35%

#### **Required Reading**

The course will use two books, readings identified in the syllabus at the specific internet address provided in the syllabus, or available on the course intranet website. When a web link is provided, check to make sure that links longer than one line do not have introduced gaps or breaks – each one has been checked and should work. Two books are required:

*Michael Rosenthal, et al., Deterring Nuclear Proliferation: The Importance of IAEA Safeguards, April 2013, Brookhaven National Laboratory* Online at  
<http://www.bnl.gov/gars/nns/iaeatextbook.php>

*Etel Solingen, Nuclear Logics: Contrasting Paths in East Asia and the Middle East, Princeton University Press, 2007*

To be purchased in the book store.

The following 3 books will be on reserve in the Melville Library:

Allan McKnight, *Atomic Safeguards: A Study in International Verification*. UNITAR  
1971 JX1974.7 .M225

David Fischer & Paul Szasz *Safeguarding the Atom: A Critical Appraisal* (Jozef Goldblat, ed).  
SIPRI 1985, [JX1974.7 .F58 1985](#)

Kurt Campbell, Robert Einhorn, & Mitchell Reiss, eds. *The Nuclear Tipping Point*, Brookings  
2004. JZ5675.N848 2004

Many classes will involve lectures with PowerPoint packages. Lecture materials will be distributed following the end of the previous class. You should review these lecture materials (slides) as you do the readings for the class. The material is complex, and review will facilitate understanding.

## Course Schedule – Topics & Readings

### Week 1 (Jan 29)

#### Part I – Introductions & review syllabus & course requirements

- Instructor introduction
- Students - introductions - who & why
- Walk through syllabus
- Course requirements & expectations

#### Part II – International Law & Some Assumptions

- Why read Allison? Its not about nuclear proliferation
- Basic concepts of treaties & agreements

#### Required Reading

- This syllabus
- Graham T. Allison, "Conceptual Models and the Cuban Missile Crisis," *American Political Science Review*. 63(3) September, 1969 pp. 689-718

<http://www3.nccu.edu.tw/~lorenzo/Allison%20Conceptual%20Models.pdf>

### Week 2 (Feb 5)

#### The Big Picture: Why do governments seek nuclear weapons? &

#### Lecture – Elements of the Nuclear Nonproliferation System &

#### Discussion of readings

- Why governments want nuclear weapons, its complicated, & foreign threats may not be a reason
- Some common assumptions regarding nuclear proliferation
- Key components of nonproliferation regime:
  - ◆ Safeguards or verification of commitment(s)



- ♦ Physical Protection (Convention on Physical Protection of Nuclear Material & IAEA INFCIRC/225 Guidelines)
- ♦ Export Controls (national controls; multinational coordination)
- ♦ Sanctions (Security Council, national & multilateral)
- ♦ Interdictions of covert shipments

Required Reading:

- "Why Do States Build Nuclear Weapons?" by Scott D. Sagan, in *New Global Dangers: Changing Dimensions of International Security*, Michael E. Brown, Owen R. Cote, Jr, Sean M. Lynn-Jones, & Steven Miller eds. Online at (PDF link at bottom of page)  
[http://cisac.stanford.edu/publications/why\\_do\\_states\\_build\\_nuclear\\_weapons\\_three\\_models\\_in\\_search\\_of\\_a\\_bomb/](http://cisac.stanford.edu/publications/why_do_states_build_nuclear_weapons_three_models_in_search_of_a_bomb/)
- Etel Solingen, Chap. 1 "Introduction" & Chap. 2 "Alternative Logics on Denuclearization," pp. 3-53 in *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*, Princeton University Press, 2007
- Michael Rosenthal, et al. *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Brookhaven Science Associates LLC, 2012. Section 1.3 "Tools Available to Reduce the Prospect of Proliferation."

Safeguards (read)

- Safeguards 101 - The Basics - PowerPoint slides (Course website)

### **Week 3 (Feb 12)**

#### **Introduction to nuclear technologies - nuclear facilities & the fuel cycle**

Lecture & Discussion

- Basics of nuclear physics - some fundamental concepts
- Uranium from the mine to UF<sub>6</sub>
- Nuclear reactors & their products
  - ♦ Research & isotope production reactors
  - ♦ Power reactors
  - ♦ Fast & breeder reactors
  - ♦ Thorium cycle
- Fuel fabrication for reactors
- Enrichment technologies - all of them, emphasis on centrifuges
- Reprocessing spent reactor fuel - technologies
- Nuclear weapons & relationship to civilian fuel cycle

Required Reading (or Viewings today):

- View Texas A&M Univ. Course Online at  
<http://nsspi.tamu.edu/nsep/courses/the-nuclear-fuel-cycle>

Read

- "Introduction" - read this section (next screen tabs bottom right corner) & watch videos
- "Front end of the fuel cycle" - read section & watch "enrichment" & "fuel fabrication" videos
- "Fuel irradiation & fuel storage" - read section & watch "introduction" & "Fuel irradiation" skip "Spent Fuel storage"
- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Appendix A "Technical Basis for Nuclear Explosions"

#### Week 4 (Feb 19)

### Φ First Steps: Baruch Plan, Atoms for Peace, creating the International Atomic Energy Agency – Bilateral assistance programs & bilateral safeguards to the Statute

#### Lecture & Discussion

- 1945 – The UN Atomic Energy Commission & the Baruch Plan
- Eisenhower's speech & vision
- Many supplier programs & competition
- Network of bilateral safeguards – the growing problem
- Eisenhower's vision as a treaty – the Statute
- The Global regime that was not to be

#### Required Reading:

- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Chapter 2 "The Nuclear Conundrum" (read pp. 11 – 22), & Chapter 3 "The Creation of the IAEA" Sections 3.1 – 3.3 & 3.6 & Appendix B "Creation of EURATOM"
- President Eisenhower. Atoms for Peace Speech to UN General Assembly December 1953. Online at  
<http://web.archive.org/web/20070524054513/http://www.eisenhower.archives.gov/atoms.htm>  
Video available:  
<http://www.youtube.com/watch?v=pnt7gKXUVWE&feature=related>
- IAEA Statute, Online at  
[http://www.iaea.org/About/statute\\_text.html](http://www.iaea.org/About/statute_text.html)

#### Further Reading:

- J. Christian Kessler & Alex Burkart, "History & Trends of International Nuclear Safeguards 1946 – 2000, (unpublished manuscript) Sections I – V. Course website
- Acheson – Lillienthal Report. Online at  
[http://www.fissilematerials.org/ipfm/site\\_down/ach46.pdf](http://www.fissilematerials.org/ipfm/site_down/ach46.pdf)
- David Fischer. *History of the International Atomic Energy Agency: The First Forty Years*. Online at [http://www-pub.iaea.org/MTCD/publications/PDF/Pub1032\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/Pub1032_web.pdf)
- Astrid Forland, Coercion or Persuasion? The Bumpy Road to Multilateralization of Nuclear Safeguards, *The Nonproliferation Review*, 16:1, March 2009. Course website

#### Week 5 (Feb 26)

### Tools of International Safeguards

#### Lecture & Discussion

- Treaties – concepts & law
- What does "safeguards" mean? – evolution of the concept
- Nuclear materials accountancy – "balancing the accounts"
- Weights & measures -- & the advantages of radiation
- Containment & surveillance
- Facilities, national accounts & whole countries

#### Required Readings

- Allan McKnight, Chapter 11 "Organization for Safeguards." *Atomic Safeguards: A Study in International Verification*. UNITAR 1971 JX1974.7 .M225 Melville Reserve
- "New Safeguards Equipment Systems: Teaming IAEA Inspectors with Technology." Online  
[http://www.iaea.org/Publications/Booklets/TeamingInspectors/teaming\\_inspectors.pdf](http://www.iaea.org/Publications/Booklets/TeamingInspectors/teaming_inspectors.pdf)
- Review Safeguards 101 - The Basics - PowerPoint slides (Course website)
- John Carlson, "Defining Noncompliance: NPT Safeguards Agreements," *Arms Control Today*, May 2009 Online at  
[http://www.armscontrol.org/act/2009\\_5/Carlson](http://www.armscontrol.org/act/2009_5/Carlson)

#### **Week 6 (Mar 5)**

#### **IAEA safeguards at the beginning, Statute provisions & INFCIRC/66**

##### Lecture & Discussion

- INFCIRC/66 safeguards - concepts, approach, requirements
- Safeguards Agreements & Facility Attachments - what are they?
- Safeguards methods & technologies
  - Facility inventories - items & materials
  - Containment & surveillance
  - Types & purposes of inspections under INFCIRC/66

##### Required Reading:

- Michael Rosenthal, et al. *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Sections 3.4 & 3.5
- Allan McKnight. Chapter 3, "The Legislative History of Safeguards in the IAEA Board of Governors (1957 - 1969)," Chapter 7 "The Safeguards Document," Chapter 8 "The Inspectors Document" and Annex 1 "A Note on Rules of International Law Relevant to IAEA Safeguards." *Atomic Safeguards: A Study in International Verification*. UNITAR. Melville Reserve
- INFCIRC/66 Rev.2, *The Agency's Safeguards System (1965, as provisionally extended in 1966 and 1968)*, (also called "The Safeguards Document"). (Course website)

##### Further Reading:

- Kessler & Burkart, "History & Trends of International Nuclear Safeguards 1946 - 2000," (unpublished manuscript) Section VI. (Course Website)

#### **Week 7 (Mar 12)**

#### **Φ Nuclear armed states - from one to how many? 1946 - 1970**

#### **USSR, UK, France, China, Sweden, West Germany, other "almost" programs**

##### Lecture & Discussion

- How the NPT nuclear weapons states came to be the Security Council Permanent 5

- Why UK & France followed
- China's adversarial relationship with the Soviet Union
- Fears/expectations of a nuclear armed world - why & what happened?
- Nuclear disarmament morphs (partly) into a nonproliferation norm

Required readings:

- Thomas Jonter, *Sweden and the Bomb: The Swedish Plans to Acquire Nuclear Weapons, 1945-1972*, SKI Report 01:33 September 2001 (Course website)
- Etel Solingen, Chap. 3 "Japan" in *Nuclear Logics: Contrasting Paths in East Asia & the Middle East*, pp. 51-81.
- Etel Solingen, Chap. 4 "South Korea" in *Nuclear Logics: Contrasting Paths in East Asia & the Middle East*, pp. 82-99.
- Etel Solingen, Chap. 4 "Taiwan" in *Nuclear Logics: Contrasting Paths in East Asia & the Middle East*, pp. 100-117.
- David Albright & Corey Gay, "Taiwan: Nuclear nightmare averted," *Bulletin of the Atomic Scientists*, January/February 1998. (Course website)
- Jenifer Mackby & Walter B. Slocombe, "Germany: The Model Case, A Historical Imperative," Chapter 8 in *The Nuclear Tipping Point*, Kurt Campbell, Robert Einhorn, & Mitchell Reiss, eds. Brookings 2004. JZ5675.N848 2004 Melville Reserve

## Spring Break

### Week 8 (Mar 26)

Φ Part I: NPT & the Grand Compromise (fuel cycle safeguards; nuclear cooperation & assistance; disarmament), the Tlatelolco alternative, introduction of "full scope" safeguards

Lecture & Discussion

- Nuclear disarmament again - Ireland's UN General Assembly Resolution
- Negotiations in the Conference on Disarmament
- The U.S. - USSR compromise draft
- Elements of the grand compromise
- Tlatelolco - the first nuclear weapons free zone

Required Reading:

- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, April 2013, Brookhaven National Laboratory. Chap. 4, "The Nuclear Nonproliferation Treaty."
- NPT - *Treaty on the Non-Proliferation of Nuclear Weapons*, Online at <http://www.iaea.org/Publications/Documents/Treaties/npt.html>
- Tlatelolco - *Treaty on the Prohibition of Nuclear Weapons in Latin America*, Online at <http://www.iaea.org/Publications/Documents/Treaties/tlatelolco.html>

Further Readings:

- Kessler & Burkart, "History & Trends of International Nuclear Safeguards 1946 - 2000," (unpublished manuscript), Sections VII - X. (Course website)

Part II: NPT Article III & INFCIRC/153 - the full scope safeguards compromise;

Lecture & Discussion

- Full-scope safeguards - the concept
- Negotiations to define it operationally
- Accounting of materials versus facility use requirements
- Model safeguards agreement - INFCIRC/153
- New Safeguards methods & technologies
  - State System of Accounting & Control
  - Subsidiary Arrangements & Facility Attachments
  - Design Information Questionnaires
  - "Significant Quantity" of nuclear material
- Zangger Committee - NPT nuclear suppliers & full-scope safeguards

Required Reading:

- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Chapters 5 "NPT Safeguards" and 6 "Safeguards Implementation under Comprehensive Safeguards Agreements."
- David Fischer. Chap. 6 "Limits in the Present Approach," Chap. 7 "Problems with Safeguards Methods," & Chap. 8 "Problems with Safeguards Procedures" in David Fischer Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, Josef Goldblat, ed. JX1974.7 .F58 1985 Melville Reserve

Further Reading

- INFCIRC/153 *The Structure and Content of Agreements between the Agency and States required in connection with the Treaty on the Non-Proliferation of Nuclear Weapons*. (Course website)

**Week 9 (April 2)**

**Φ Who stood outside & why? - Part I**

**France & China**

**India's PNE test (1974) - Pakistan - London Suppliers' Group**

**Argentina & Brazil**

Lecture & Discussion

- Why France & China did not join NPT
- India's "PNE" test - Canadian & U.S. facilities
- Suppliers' response - London Club - the beginning of nonproliferation export controls
- The South Asian security & proliferation dynamic
- Nuclear weapons for power, or for prestige, or for protection?
- Zulfikar Ali Bhutto - eating grass (real grass) & national defense in Pakistan
- Argentina & Brazil - nuclear weapons, nuclear submarines, open options
- Creation of ABACC - Tlatelolco full-scope safeguards & a regional inspectorate

Required Reading:

- Kessler & Burkart, "History & Trends of International Nuclear Safeguards 1946 - 2000," (unpublished manuscript), Section XI - XII. (Course website)

India & Pakistan

- Sumit Ganguly, "India's Pathway to Pokhran II: The Prospects and Sources of New Delhi's Nuclear Weapons Program," *International Security*, Vol. 23, No. 4 (Spring, 1999), pp. 148-177. (Course website)
- Samina Ahmed, "Pakistan's Nuclear Weapons Program: Turning Points and Nuclear Choices," *International Security*, Vol. 23, No. 4 (Spring, 1999), pp. 178-204. (Course website)

website)

- "Agreement On Reducing The Risk From Accidents Relating To Nuclear Weapons" Online at <http://www.stimson.org/research-pages/agreement-on-reducing-the-risk-from-accidents-relating-to-nuclear-weapons/>

#### Argentina - Brazil

- Julio C. Carasales "The so- called proliferator that wasn't: The story of Argentina's nuclear policy," *The Nonproliferation Review* Fall 1999 Online at <http://cns.miis.edu/npr/pdfs/carasa64.pdf>
- Aaron Karp, letter to the editor & Carasales response, *The Nonproliferation Review*, Sprint 2000, Online at <http://cns.miis.edu/npr/pdfs/corr71.pdf>
- Daniel Flesmes, "Brazil's Nuclear Policy From Technological Dependence to Civil Nuclear Power," *GIGA Research Program: Dynamics of Violence and Security Cooperation*, N° 23 June 2006. Section 3 to end (Course website)
- José Goldemberg, "Looking Back: Lessons From the Denuclearization of Brazil and Argentina" *Arms Control Today*, April 2006, online at [http://www.armscontrol.org/act/2006\\_04/LookingBack](http://www.armscontrol.org/act/2006_04/LookingBack)

#### Further Reading:

- Seymour M. Hirsch, "On the Nuclear Edge", *The New Yorker*, 1993 , Online at <http://chagataikhan.blogspot.com/2009/05/on-nuclear-edge-by-seymour-m-hersh.html>
- David Fischer, "International Safeguards" Chap. 13.1 - 13.5, in David Fischer & Paul Szasz, *Safeguarding the Atom: A Critical Appraisal*, Josef Goldblat, ed. JX1974.7 .F58 1985 Melville Reserve

### **Week 10 (April 9)**

#### **Φ Who stood outside the NPT & why? - Part II**

**Israel - the politics & policy of ambiguity**

**South Africa - secret program & public disarmament**

#### Lecture & Discussion

- The politics of ambiguity - when national security favors being vague
- The political decision - nuclear weapons vs. national security
- Verifying South Africa's dismantlement - the international challenge

#### Required Reading:

##### Israel

- Etel Solingen, Chap. 9, "Israel" pp. 187-212, in *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*
- Alann Dowty, "Nuclear Proliferation - The Israeli Case," *International Studies Quarterly*, Vol. 22, no. 1 (March 1978), (course Website)

- Avner Cohen & Marvin Miller, Facing the unavoidable: Israel's nuclear monopoly revisited," *Journal of Strategic Studies* Volume 13, Issue 3, 1990 (Course Website)

#### South Africa

- Frank V. Pabian. South Africa's Nuclear Weapons Program: Lessons for U.S. Nonproliferation Policy. *The Nonproliferation Review*. Fall 1995 Online at <http://cns.miis.edu/npr/pdfs/31pabian.pdf>
- Adolf von Baeckman, Gary Dillon, & Demetrius Perricos, "Nuclear Verification in South Africa" in *IAEA Bulletin* vol. 37, no. 1, (Course Website)

#### Further Reading:

- Avner Cohen, "Israel and the Evolution of U.S. Nonproliferation Policy: The Critical Decade (1958-1968)" *The Nonproliferation Review*, Winter 1998 (Course Website)
- Zondi Masiza, "A Chronology of South Africa's Nuclear Program" *The Nonproliferation Review*, Fall 1993, pp. 35 - 55. Online at <http://cns.miis.edu/npr/pdfs/masiza11.pdf>

### **Week 11 (April 16)**

#### **Φ Perfidy & reform - Iraq's covert nuclear weapons program IAEA's Programme 93+2 reforms (including the Additional Protocol) Nuclear Supplier Group dual-use technologies reforms**

##### Lecture & Discussion

- Osirak reactor bombing (1982)
- Saddam's network of suppliers
- Discovering the dimensions of Iraq's enrichment programs
- Political consensus on need to expand scope of safeguards - 93+2
- New Safeguards methods & technologies of the Additional Protocol
  - Environmental sampling - outside declared facilities
  - Satellite imagery - remote sensing
  - Inspection of undeclared facilities
  - Comprehensive inventories
  - Supplier declarations of exports

#### Required Reading:

##### Iraq's Nuclear Program

- Etel Solingen, Chap. 9, "Iraq" pp. 143-163, in *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*
- J C Davis & David A. Kay, "Iraq's secret nuclear weapons program" in *Physics Today*, v45:7 (1992 Jul 01): 21-27 (Course website)

##### 93+2 IAEA Safeguards Reform

- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*. Chap. 7 "The IAEA Responds to Challenges."



- Richard Hooper "The Changing Nature of Safeguards." *IAEA Bulletin* 45/1. June 2003. (Course Website) or Online at [www.iaea.org/Publications/Magazines/Bulletin/Bull451/article2.pdf](http://www.iaea.org/Publications/Magazines/Bulletin/Bull451/article2.pdf)
- Eva Gyane, "Information-Driven Safeguards: A Country Officer's Perspective," IAEA-CN-184/41, IAEA Symposium on International Safeguards, November 2010. (course Website)
- The Additional Protocol (INFCIRC/540). (Course Website) or Online at <http://www.iaea.org/Publications/Documents/Infcircs/1997/infirc540c.pdf>  
[read main text, scan annexes]

#### Further Reading - Iraq:

- IAEA's Iraq Nuclear Verification Office (INVO). "Iraq's Nuclear Weapon Programme." Online at <http://www.iaea.org/OurWork/SV/Invo/factsheet.html>
- Les Thorne, "IAEA Nuclear Inspections in Iraq" IAEA Bulletin 1/1992, (course Website)

#### Further Reading - Programme 93+2:

- Theodore Hirsch "The Additional Protocol: What it is & Why it Matters" *The Nonproliferation Review*. Fall/Winter 2004, pp. 140 - 152. Online at <http://cns.miis.edu/npr/pdfs/113hirsch.pdf>
- Trevor Findlay, "Looking Back: The Additional Protocol," *Arms Control Today* Nov. 2007 Online at <http://www.armscontrol.org/print/2668>
- Kessler & Burkart, "History & Trends of International Nuclear Safeguards 1946 - 2000," (unpublished manuscript), Section XIII - end. (Course Website)

### **Week 12 (April 23)**

#### **Φ North Korea - Board of Governors, Security Council, 6 Party Talks, & beyond**

##### Lecture & Discussion

- Kim Il-Sung accedes to the NPT in Moscow
- The nuclear weapons program caught - Board of Governors 2<sup>nd</sup> violation finding, to the Security Council
- Crisis, hints of war, the Agreed Framework
- Bush retrenches, & 6 Party Talks
- Reasons for North Korea's nuclear weapons program
- Is North Korea a threat? Why?
- Where do we go from here?

##### Required Reading:

- Alexandre Y. Mansourov, "The Origins, Evolution, and Current Politics of the North Korean Nuclear Program" *The Nonproliferation Review*, Spring/Summer 1995, Online at <http://cns.miis.edu/npr/pdfs/mansou23.pdf>
- Etel Solingen, Chap. 9, "North Korea" pp. 118-140, in *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*, Princeton University Press, 2007
- David Fischer, "The DPRK's Violation of its NPT Safeguards Agreement with the IAEA" [excerpt from *History of the International Atomic Energy Agency* (1997, published by the IAEA)] <http://www.iaea.org/newscenter/focus/iaeadprk/dprk.pdf>
- Robert Gallucci, "U.S.-DPRK Agreed Framework" Testimony before House International Relations Committee. February 1995. Online at



<http://dosfan.lib.uic.edu/ERC/bureaus/eap/950223GallucciUSDPRK.html>

- Siegfried S. Hecker, Chaim Braun, & Robert L. Carlin, "North Korea's Light Water Reactor Ambitions," *Journal of Nuclear Materials Management*, Spring 2011, (Course website)
- Jennifer Lind, Keir A. Lieber, and Daryl G. Press, "Pyongyang's Nuclear Logic: Sometimes a Test is Just a Test," *Foreign Affairs*, February 13, 2013 Online at <http://www.foreignaffairs.com/print/136050>
- Arms Control Association "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy" <http://www.armscontrol.org/factsheets/dprkchron>

Further Reading:

- GlobalSecurity.org - Inventory of North Korea's nuclear facilities. Online at <http://www.globalsecurity.org/wmd/world/dprk/yongbyon.htm>
- ISIS (Institute for Science & International Security) North Korea, Online at <http://isis-online.org/countries/category/korean-peninsula/>

**Week 13 (April 30)**

**Φ Iran -- Board of Governors, EU-3, & Security Council**

**Lecture & Discussion**

- Bushehr & civil nuclear power
- Iran's enrichment program
- What are Iran's objectives? What are Iran's motives? For what kind of program really?
- The EU-3 respond - who are they & why them?
- Safeguards violations & Security Council Resolutions
- Stand-off & where do we go from here?

Required Reading:

- Etel Solingen, Chap. 9, "Iran" pp. 164-186, in *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*
- Greg Bruno, "Iran's Nuclear Program," Council on Foreign Relations Backgrounder, Online at <http://www.cfr.org/iran/irans-nuclear-program/p16811>
- Clifton W. Sherrill, "Why Iran wants the bomb and what it means for policy," *The Nonproliferation Review*, 19:1 2012, Course Website
- IAEA GOV/2012/37, Report by the Director General *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council Resolutions in the Islamic Republic of Iran* August 30, 2012 Online

<http://www.iaea.org/Publications/Documents/Board/2012/gov2012-37.pdf>

- INFCIRC/724. Communication dated 26 March 2008 received from the Permanent Mission of the Islamic Republic of Iran to the Agency. Online at <http://www.iaea.org/Publications/Documents/Infcircs/2008/infcir c724.pdf>

Further Reading:

- ISIS Reports, "Opening the Door to a Solution with Iran" by David Albright and Olli Heinonen, May 9, 2012 Online at <http://isis-online.org/isis-reports/detail/opening-the-door-to-a-solution-with-iran/>
- IAEA website on Iran - Online at <http://www.iaea.org/NewsCenter/Focus/IaeaIran/index.shtml>
- ISIS (Institute for Science & International Security) Iran page Online at <http://isis-online.org/iaea-reports/category/iran/>
- IAEA GOV/2012/23, Report by the Director General *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council Resolutions in the Islamic Republic of Iran* May 25, 2012 Online at [www.iaea.org/Publications/Documents/Board/2012/gov2012-23.pdf](http://www.iaea.org/Publications/Documents/Board/2012/gov2012-23.pdf)
- IAEA GOV/2011/65, Report by the Director General *Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council Resolutions in the Islamic Republic of Iran* Nov. 8, 2011 Online at [www.iaea.org/Publications/Documents/Board/2011/gov2011-65.pdf](http://www.iaea.org/Publications/Documents/Board/2011/gov2011-65.pdf)

**Week 14 (May 7)**

**Φ Part I: Global Regime Redux – Has the system worked?**

Discussion Points:

- What recommendations would you give to solving current "problem cases?" – i.e., Iran, Syria, North Korea? Are there others?
- Do you think any of the proliferation cases covered in the course could have been prevented? How?
- Which factors lead a country to pursue a nuclear weapons capability? Which factors might make a country choose not to pursue the nuclear option?
- Do nuclear weapons contribute to or detract from security?
- What is the solution to the debate over enrichment & reprocessing? Which of the points made by the 'haves' and 'have not's' are valid?
- Can nuclear power be expanded in such a way as to adequately control proliferation risk?
- Is disarmament possible and/or likely?

Required Reading

- Lewis A. Dunn, "Countering Proliferation: Insights from Past 'Wins, Loses, and Draws'" *The Nonproliferation Review*, vol. 13, No 3, November 2006, pp. 479 – 489. Online at <http://cns.miis.edu/npr/pdfs/133dunn.pdf>
- [REVIEW] John Carlson, "Defining Noncompliance: NPT Safeguards Agreements," *Arms Control Today* May 2009 Online at [http://www.armscontrol.org/act/2009\\_5/Carlson](http://www.armscontrol.org/act/2009_5/Carlson)

- Pierre Goldschmidt "Safeguards Compliance: A Challenge for the IAEA & the UN Security Council" *Arms Control Today* Jan/Feb 2010 Online at [http://www.armscontrol.org/act/2010\\_01-02/Goldschmidt](http://www.armscontrol.org/act/2010_01-02/Goldschmidt)
- [REVIEW] "Why Do States Build Nuclear Weapons?" by Scott D. Sagan, in *New Global Dangers: Changing Dimensions of International Security*, Michael E. Brown, Owen R. Cote, Jr, Sean M. Lynn-Jones, & Steven Miller eds. Online at [http://cisac.stanford.edu/publications/why\\_do\\_states\\_build\\_nuclear\\_weapons\\_three\\_models\\_in\\_search\\_of\\_a\\_bomb/](http://cisac.stanford.edu/publications/why_do_states_build_nuclear_weapons_three_models_in_search_of_a_bomb/)
- Jacque E. C. Hymans, "Botching the Bomb: Why Nuclear Weapons Programs Often Fail on Their Own - and Why Iran Might, Too," *Foreign Affairs* May/June 2012 (Course Website)
- Michael Rosenthal, et al., *Deterring Nuclear Proliferation: The Importance of IAEA Safeguards*, Chap. 8 "Looking Towards the Future."

#### Further Reading

- David Albright, Ollie Heinonen, and Orde Kittrie, "Understanding the IAEA's Mandate in Iran: Avoiding Misinterpretations" ISIS Report, November 27, 2012, Online at [http://isis-online.org/uploads/isis-reports/documents/Misinterpreting\\_the\\_IAEA\\_27Nov2012.pdf](http://isis-online.org/uploads/isis-reports/documents/Misinterpreting_the_IAEA_27Nov2012.pdf)

### **Part II: Review & Open discussion – Your Questions & exam prep**

#### **Finals Week**

May 12 – Papers due 5:00 p.m. in my box

May 12 – Final exam

#### **Annex – Useful Web Sites**

**International Atomic Energy Agency**

<http://www.iaea.org/Publications/Documents/index.html>

**Arms Control Association** <http://www.armscontrol.org/>

**GlobalSecurity.Org** <http://www.globalsecurity.org/>

**Institute for Science & International Security** <http://www.isis-online.org/>

**James Martin Center for Nonproliferation Studies, Monterey Institute for International Studies** <http://cns.miis.edu/>

**Nuclear Threat Initiative** <http://www.nti.org/index.php>

World Nuclear Association <http://www.world-nuclear.org>

Nonproliferation Policy Education Center. <http://www.npec-web.org/>

Carnegie Endowment for International Peace. <http://www.carnegieendowment.org/topic/>

Center for Strategic and International Studies. <http://csis.org/>

The Nuclear Weapon Archive - A Guide to Nuclear Weapons  
<http://www.nuclearweaponarchive.org/>

**Appendix 2:** Feedback from Students Participating in the 2014 Nuclear  
Nonproliferation, Safeguards and Security in the 21<sup>st</sup> Century Course

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES		✓	
5. STRUCTURE OF NPT SAFEGUARDS		✓	
6. SAFEGUARDS IMPLEMENTATION		✓	
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION	✓		
STUDENT PRESENTATIONS	✓		

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	(OK)	DETRIMENTAL
WAS THE SEQUENCING	(OK)	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	(VALUABLE)	HELPFUL	NOT HELPFUL

I thoroughly enjoyed this course but, while I enjoyed the history, I felt like it could have been shortened. I also wish we could have spent more time on nuclear security and terrorism. Overall, all of the speakers were excellent. Thank you →

for working so hard to put together such an excellent course!

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓✓✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES			✓
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES		✓	
5. STRUCTURE OF NPT SAFEGUARDS		✓	
6. SAFEGUARDS IMPLEMENTATION		✓	
7. DIV SIMULATION		✓	
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS		✓	
9. REGIONAL CHALLENGES		✓	
10. EXPORT CONTROLS/GAME CHANGERS		✓	
11. A. NUCLEAR SECURITY		✓	
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION	✓		
STUDENT PRESENTATIONS		✓	

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

I think too much time was spent on history of NPT and too much time spent on safeguards in general. I LOVED the interactive pieces of the program (lab visits, simulations, discussions). It's hard to listen for →

three weeks, <sup>+</sup> 8 hrs a day. I also just learn better when I am participating. Overall, GREAT course!

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES			✓
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES		✓	
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES		✓	
5. STRUCTURE OF NPT SAFEGUARDS		✓	
6. SAFEGUARDS IMPLEMENTATION		✓	
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS		✓	
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS			✓
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION	✓		
STUDENT PRESENTATIONS	✓		

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL



**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS	✓		
4. NPT CHALLENGES	✓		
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION		✓	
STUDENT PRESENTATIONS			

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	✓ OK	DETRIMENTAL
WAS THE SEQUENCING	OK	✓ OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE ✓	HELPFUL	NOT HELPFUL

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS	✓		
4. NPT CHALLENGES	✓		
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS		✓	
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS		✓	
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION	✓		
STUDENT PRESENTATIONS	✓		

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

AN AWESOME COURSE !!!

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES			✓
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES		✓	
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES		✓	
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES		✓	
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY		✓	
11. B. NUCLEAR SECURITY AND TERRORISM		✓	
11. C. GNDA SIMULATION	✓		
STUDENT PRESENTATIONS			

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

Non-technical students need an early basic introduction to detectors and WMD. This way the lab visits are a lot more useful. This year's introduction was too historical and not very focused on the technical aspects.

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WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	X		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	X		
3. NPT – THE THREE PILLARS		X	
4. NPT CHALLENGES		X	
5. STRUCTURE OF NPT SAFEGUARDS	X		
6. SAFEGUARDS IMPLEMENTATION	X		
7. DIV SIMULATION	X		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	X		
9. REGIONAL CHALLENGES		X	
10. EXPORT CONTROLS/GAME CHANGERS		X	
11. A. NUCLEAR SECURITY	X		
11. B. NUCLEAR SECURITY AND TERRORISM		X	
11. C. GNDA SIMULATION			X
STUDENT PRESENTATIONS			X

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS	✓		
4. NPT CHALLENGES	✓		
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION		✓	
STUDENT PRESENTATIONS	✓		

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

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WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓	✓	
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES		✓	
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓	✓	
9. REGIONAL CHALLENGES		✓	
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓✓✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓✓✓		
11. C. GNDA SIMULATION		✓	
STUDENT PRESENTATIONS		✓	

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS		✓	
4. NPT CHALLENGES	✓		
5. STRUCTURE OF NPT SAFEGUARDS		✓	
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDA SIMULATION		✓	
STUDENT PRESENTATIONS	✓		

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK	DETRIMENTAL
WAS THE SEQUENCING	OK	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL	NOT HELPFUL

**PLEASE RATE EACH COURSE MODULE BASED ON THE EXTENT TO WHICH IT MET YOUR OBJECTIVES IN TAKING THE COURSE**

WE WOULD LIKE TO GET YOUR FEEDBACK TO HELP IMPROVE THE COURSE DESIGN FOR NEXT YEAR			
MODULE	Very Important	Important	Not important
1. INTRODUCTION TO NUCLEAR ENERGY/WEAPONS RELATED MATERIALS & ACTIVITIES	✓		
2. EARLY NUCLEAR AND NONPROLIFERATION POLICY/THE NPT EMERGES	✓		
3. NPT – THE THREE PILLARS	✓		
4. NPT CHALLENGES	✓		
5. STRUCTURE OF NPT SAFEGUARDS	✓		
6. SAFEGUARDS IMPLEMENTATION	✓		
7. DIV SIMULATION	✓		
8. SAFEGUARDS CHALLENGES AND STRENGTHENED SAFEGUARDS	✓		
9. REGIONAL CHALLENGES	✓		
10. EXPORT CONTROLS/GAME CHANGERS	✓		
11. A. NUCLEAR SECURITY	✓		
11. B. NUCLEAR SECURITY AND TERRORISM	✓		
11. C. GNDP SIMULATION	✓		
STUDENT PRESENTATIONS		✓	

WE KNOW THERE WAS REPETITION AND SOME LECTURES OUT OF SEQUENCE.			
WAS THE REPETITION	REINFORCING	OK ✓	DETRIMENTAL
WAS THE SEQUENCING	OK ✓	OF NO MATTER	DETRIMENTAL
WAS THE TEXTBOOK	VALUABLE	HELPFUL ✓	NOT HELPFUL



### **Appendix 3: Trip Reports for Professional Development Activities**



## **Nonproliferation and National Security Department Safeguards and Nonproliferation Policy Group**

### **Trip Report**

Traveler: Nick Gallucci

Purpose of Trip: Develop program management skills and tools

Date of Trip: October, 2014

Sponsor: Next Generation Safeguards Initiative Human Capital Development

Summary of Activities: The Project Management Professional (PMP) training course, which was held at BNL, is designed to give current and future Project Managers the skills and techniques they need to effectively lead and oversee project work. This training complemented my job functions nicely, providing me with a helpful template by which to organize and execute project-related tasks. I feel that I am a more productive project contributor and more capable project leader having completed this training course.

Note: This activity was conducted at BNL, and therefore, no travel was involved.



## **Nonproliferation and National Security Department Safeguards and Nonproliferation Policy Group**

### **Trip Report**

Traveler: Katherine Bachner

Purpose of Trip: To attend JRC Ispra Nuclear Safeguards and Nonproliferation Course

Date of Trip: March 31- April 4, 2014

Sponsor: Next Generation Safeguards Initiative Human Capital Development Sub-element

#### **Summary of Activities:**

The participant was invited to attend the JRC Ispra course on nuclear safeguards and nonproliferation in Ispra, Italy, in April of 2014, which she was able to do with the assistance of the HCD program. She found it to be a very useful course, despite having significant experience in nonproliferation and safeguards previously, and would highly recommend it to others. The course attendees included professionals from all around the world, and the age ranges of those in attendance were from early career to those with over 25 years of relevant professional nuclear experience behind them. The agenda is attached.



## **Nonproliferation and National Security Department Safeguards and Nonproliferation Policy Group**

### **Trip Report**

Travelers: Jose Gomera and Sarah Poe

Purpose of Trip: NGSPN meeting at LANL/ SNL

Date of Trip: 3/10/14 – 3/13/14

Sponsor: Next Generation Safeguards Initiative Human Capital  
Development Sub-element

#### **Summary of Activities:**

The Next Generation Safeguards Professional Network meeting was hosted by LANL/SNL as a means to network with other safeguards professionals. It was also a valuable introduction to a variety of topics related to safeguards that the presenters were working on. At SNL, the topics of presentations included information assurance, cryptography, geospatial intelligence, and intrusion detection/physical security. We had the opportunity to visit the Integrated Security Facility and see first-hand what a modern physical protection system was capable of and the basics of how physical security generally works. A couple of other topics discussed at Sandia included biological threat reduction and chemical security. I found that to be very useful because they are topics I don't typically think about and because I will be working for a few of weeks in FY15 helping Joe Brady with his Chemical Security Engagement Program which is funded by the Department of State. At LANL, we had the opportunity to visit the plutonium production facility and get a lot of our questions about the nuclear deterrent answered. We also learned about safeguards by design and the new state level approach to safeguards that the IAEA has been transitioning to.

I had the opportunity to tour facilities at Sandia and Los Alamos, as well as Aquila Technologies. I was able to make some contacts that I later submitted proposals with and hope to continue to engage them about professional opportunities. I became interested in Monte Carlo N-Particle modeling by talking to Mike Fensin who is a developer on that software and also attended the meeting. I

was able to obtain that software and I am currently taking a course on Monte Carlo Methods to help me in learning how to use the code and the general methodology. I was also very glad to be able to personally meet Bryan Boyer, who had just taught a class I had taken in the fall through Penn State. This meeting helped me to understand the real world implications of topics which I had only seen in an academic setting.